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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/540,629	06/23/2005	Yuichi Tokita	S1459.70075US00	5380

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EXAMINER	
MCDONALD, RODNEY GLENN	

ART UNIT	PAPER NUMBER
1795	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/540,629	TOKITA ET AL.	
	Examiner	Art Unit	
	Rodney G. McDonald	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *22 April 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,3 and 5-11* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,3 and 5-11* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *7-8-09*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1, 3, 5-10 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Claims 1, 3, 5-10 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Specifically, the specification does not provide support for excluding the metals osmium, iron and ruthenium.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.

Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1, 3 and 5-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Adachi et al. "Dye-sensitized Solar Cells Using Semiconductor Thin Film Composed of Titania Nanotubes", Electrochemistry, June 2002, Volume 70, No. 6, pp. 449-452 in view of Inoue et al. (Japan 2002-063949) and Graetzel et al. (U.S. Pat. 5,350,644), Wariishi et al (U.S. Patent 6,376,765) and Yoshikawa (U.S. Patent 6,586,670).

Regarding claims 1, 11, Adachi et al. teach a dye sensitized photoelectric transfer device prepared by forming a semiconductor layer containing titania nanotubes that are sensitized with a ruthenium dye (see the Experimental pages 449-450). Adachi et al soaks the titania nanotubes (which are coated on a glass substrate) in an ethanol solution of ruthenium dye for 20 hr the dye-sensitized titania nanotubes (see page 450). It is the Examiner's position that this inherently results in the dye being "retained" by the nanotubes.

Regarding claim 5, the diameter of each nanotube is 10 nm. (See page 450)

Regarding claim 6, the titania nanotubes are formed as anatase crystal. (See Abstract)

Regarding claim 7, there is a semiconductor layer and an electrolyte layer provided between a pair of opposed electrodes. (See Page 450)

Regarding claim 8, there is a semiconductor layer (titania) and an electrolyte layer provided between a transparent conductive substrate (tin oxide) and a conductive substrate as a counter electrode (Pt) of the transparent conductive substrate to generate electric energy between the transparent conductive substrate and the conductive substrate by photoelectric transfer. (See Page 459, 450)

Regarding claim 9, this is a transparent glass substrate having a dope tin oxide conductive film. (See Page 449)

Regarding claim 10, the transfer device is configured as a dye sensitized solar cell. (See page 450)

The difference between Adachi et al. and the present claims is that utilizing a metal complex dye that excludes iron, ruthenium and osmium is not discussed (Claim 1), the dye having no acidic substituents is not discussed (Claims 1, 11), the photoelectric transfer efficiency being greater than about 10% is not discussed (Claims 1, 11), the titania nanotube retaining at least two kinds of sensitizing dye is not discussed (Claim 3), the particles of the dyes not associating is not discussed (Claims 1, 11), no suppression of dye association being performed is not discussed (Claims 1, 11) and where the sensitizing dye is a porphyrin-based compound (Claim 11).

Regarding a metal complex dye that excludes iron, ruthenium and osmium (Claims 1, 11), Inoue et al. suggest that a metal complex dye of porphyrin compounds can be used for solar cells. The metal can be W. The dye has no acidic substituents (i.e. where R is Hydrogen). (See Abstract; Entire document)

The motivation for utilizing a metal complex dye such as porphyrin containing for example W is that it allows for high photovoltaic conversion characteristics. (See Abstract)

Regarding the dye having no acidic substituents (Claims 1, 11), Graetzel et al. teach in Table 1 in Examples 7 (i.e. Ru (2, 2'-bipyridyl)$_2$(CN)$_2$) and 8 a dye for a photoelectric transfer device that has no acidic substituents. (See Table 1 Column 9 Examples 7, 8; Column 9 lines 57-59) Inoue et al. suggest that a metal complex dye of porphyrin compounds can be used for solar cells. The metal can be W. The dye has no acidic substituents (i.e. where R is Hydrogen). (See Inoue et al. discussed above Abstract; Entire document)

Regarding the photoelectric transfer efficiency being greater than about 10% (Claims 1, 11), Graetzel et al. teach in Example 36 achieving a photoelectric transfer efficiency of 11%. (Column 14 lines 24-25) Graetzel et al. teach that the complexes of Examples 1-33 (i.e. see Examples 7, 8 of Table 1) can be used in place of the complexes of Example 36 to achieve a similar result. (Column 16 lines 36-39)

Regarding where the sensitizing dye is an inorganic complex dye (Claims 1, 11), Graetzel et al. teach in Table 1 in Example 7 a dye having no acidic substituents. (i.e. Ru (2,2'-bipyridyl)$_2$(CN)$_2$) The dye is an inorganic complex dye because the compound

is a compound having a central metal atom (usually a transition element) bonded to one or more nonmetallic ligands (inorganic, organic, or both) and are often intensely coloured. Furthermore, the compound is inorganic because of the Ru, CN and most compounds considered the purview of modern inorganic chemistry contain organic ligands, i.e. 2,2' -bypyridine.

The motivation for utilizing the features of Graetzel et al. is that it allows for producing a photoelectric transfer device with higher efficiency than the conventional device. (Column 14 lines 31-32)

Regarding claim 3, Wariishi et al teaches dyes that can be used in dye-sensitized solar cells (see col. 26, lines 56 through col. 54). Many dyes, such as dyes S-1, S-3 to S-20, S-22, S-23, S-27 to S-29, S-33, S-37 and S-41, among the dyes illustrated by Wariishi et al do not contain acidic groups (see col. 47 through col. 52). Wariishi et al also teaches that two or more dyes may be used as a mixture to obtain a large photoelectric conversion region and a high photoelectric conversion efficiency (see col. 26, lines 59-62). Yoshikawa also teaches dyes that can be used in dye-sensitized solar cells, such as dye M-1 at col. 24, which does not contain acidic groups. Yoshikawa also teaches that two or more dyes may be used as a mixture to obtain a large photoelectric conversion region and a high photoelectric conversion efficiency (see col. 20, lines 62-66).

Regarding claim 1, Yoshikawa teaches that a colorless compound may be co-adsorbed together with the dyes to weaken an interaction between the dyes, such as association (see col. 13, lines 42-49). Thus, even if there was association of dyes, a

skilled artisan would know how to weaken this interaction so that there is essentially no association. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have used a dye that has no acidic groups as the sensitizing dye because such dyes are conventional in the art, as shown by Wariishi et al. and Yoshikawa.

Regarding the no suppression of dye association being performed (Claims 1, 11), as discussed above Wariishi et al. and Yoshikawa teach utilizing dyes containing no acidic substituents. These dyes are the same dyes required by Applicant and therefore would not associate with each other. (See Wariishi et al. and Yoshikawa discussed above)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Adachi et al. by utilizing the features of Inoue et al. and Graetzel et al. because it allows for producing a photoelectric transfer device with higher efficiency than the conventional device.

It would also have been obvious to one of ordinary skill in the art at the time the invention was made to have used mixtures of dyes because with mixtures of dyes a large photoelectric conversion region and a high photoelectric conversion efficiency can be obtained, as shown by Wariishi et al and Yoshikawa. Furthermore, it would also have been obvious to one of ordinary skill in the art at the time the invention was made to have prevented association of the dyes because it is known in the art that a colorless compound may be co-adsorbed together with the dyes to weaken an interaction between the dyes, such as association, as taught by Yoshikawa and that if the dyes

contained no acidic substituents as required by Applicant's claims there would be no dye association of dyes.

Response to Arguments

Applicant's arguments filed April 22, 2009 have been fully considered but they are not persuasive.

In response to the argument that that the 112 1st paragraph rejection has been overcome, it is argued that while the 35 U.S.C. 112 1st paragraph rejection of the previous office action has been overcome there is now a new 35 U.S.C. 112 1st paragraph rejection caused by Applicant's amendment. The new 35 U.S.C. 112 1st paragraph rejection is discussed above.

In response to the argument that none of the prior art of record teaches utilizing a metal complex dye which comprises an element other than iron, ruthenium and osmium, it is argued that Inoue et al. (JP 2002-063949) teaches utilizing a metal complex dye for a solar cell. The metal can be W. (See Inoue et al. discussed above)

In response to the argument that the prior art does not teach a porphyrin based compound, it is argued that Inoue et al. teach utilizing a porphyrin based compound for a dye of a solar cell. (See Inoue et al. discussed above)

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rodney G. McDonald whose telephone number is 571-272-1340. The examiner can normally be reached on M-Th with every Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam X. Nguyen can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Rodney G. McDonald/
Primary Examiner, Art Unit 1795

Rodney G. McDonald
Primary Examiner
Art Unit 1795

RM
August 26, 2009